DE 198 48 677 A1

Insulation element

Abstract

The invention relates to a nonwoven-based insulation element (1). In order to specify a nonwoven-based insulation element which is distinguished by the fulfilment of one or more requirements, such as high sound absorption and sound insulation, high heat insulation and low liquid-water formation in the case of pronounced temperature gradients and pronounced air humidity gradients, a layered build-up consisting of different nonwovens, such as textured nonwoven or melt-spun nonwoven, is proposed.

Description

The invention relates to a nonwoven-based insulation element.

Such insulation elements have already become known in various forms. However, the known insulation elements are not yet satisfactory in every respect in terms of various requirements which increasingly are to be implemented in combination. These requirements include high sound absorption and sound insulation (characterized by the absorption coefficient a_s and the sound insulation number R). In addition to this, also high heat insulation (characterized by lambda) and low liquid-water formation in the case of pronounced temperature gradients and pronounced air humidity gradients. This is also as far as possible to be combined with comparatively low surface weights and easy handling as an installation element.

The invention is therefore concerned with the technical problem of specifying a nonwoven-based insulation element which is distinguished by a high fulfilment of one or more of the abovementioned requirements.

This technical problem is solved in the first place, and essentially, in the subject matter of Claim 1, this being aimed at ensuring that the insulation element has a layered build-up consisting of different nonwovens. Further, this technical problem is also solved in that the insulation element has a layered build-up consisting of different foam materials. In the first-mentioned case, the various nonwovens can also be combined with one or more foam material layers, and in the second-mentioned case the various foam materials can also be combined with one or more nonwoven layers. The preferably different degrees of compaction are advantageously achieved by means of different fibres and/or nonwoven production methods and/or foam materials of different densities. A nonwoven ply or a foam material ply, for example a nonwoven ply consisting of textured nonwoven or a foam material ply consisting of polyimide foam material, is very light-weight, along with a comparatively large volume. There are relatively large interspaces between the fibres. A further nonwoven ply, here, in the example, a melt-spun nonwoven, is built up more densely. By various nonwovens or nonwoven and foam materials being assembled together in plies, the different properties, particularly with regard to sound absorption, are utilized in combination. It is particularly preferable to form a middle ply as a textured nonwoven ply or to arrange a nonwoven with higher compaction, for example a ply as a melt-spun nonwoven, as a ply with a low weight per volume in terms of foam material, and on both sides of such a middle ply. The middle ply is

also preferably formed with a greater thickness than the further plies, in particular the further nonwoven plies. In the example, these are the plies consisting of melt-spun nonwoven. The nonwoven ply of lower density, here, therefore, preferably the middle ply, preferably also possesses a multiple of the thickness of the nonwoven layer of greater density, here, therefore, of the two further nonwoven plies consisting of melt-spun nonwoven. The nonwoven plies may, further, be covered by film plies. In particular the film plies are provided as outer plies. Also, the film plies may additionally be provided as intermediate plies. Further, the outer films are preferably edge-welded, although the nonwoven or foam material plies may be integrated completely or partially into the weld seam. This is achieved, for example, by an edge compaction of the nonwoven or foam material plies which almost approaches zero. Such edge compaction may also be utilized for component shaping. Fastening elements may also be integrated into such a weld seam. The outer films are in this case suitably joined together such that the overall composite structure is held together solely by the edge-connected or edge-welded films and, if appropriate, nonwoven or foam material plies. Adhesive bonding, lamination or the like of individual plies is not necessary and is preferably not provided. The plies are merely simply laid one over the other, in any event outside the edge region. This gives rise, as it were, to a cushion with an envelope formed by the outer films. Partial compaction is brought about by means of the welds, particularly in the edge region, and may contribute to reception of fastening elements and/or stiffenings of the component. The plurality of nonwoven plies, if appropriate with an integrated foam material ply, lead to a type of impact filling. It is also important, for the article, that liquid-water formation in the component is reduced. The films used, both the outer films and, if appropriate, the intermediate films, have different water vapour permeabilities. Preferably, films are also used which have directionally active water vapour permeabilities. Films may also be used which have moisture- and/or temperature-dependent water vapour permeabilities.

Furthermore, the invention is explained below with reference to the accompanying drawing which, however, illustrates only exemplary embodiments and in which:

Fig. 1 shows a partially cut away perspective view of an insulation part of a first embodiment; and

Fig. 2 shows an illustration, corresponding to Fig. 1, of a second insulation part.

The insulation part 1 consists of a lower and an upper covering film 2 and 2' and of three central nonwoven plies 3, 4 and 5. The nonwoven plies 3 and 5 are formed from identical or non-identical nonwoven material. The fibres of the nonwoven material consist of a polymer, such as, for example, PPS, or of a mixture of PPS and copolyester or other organic or inorganic fibres. The surface weights of the nonwoven plies 3, 4 and 5 lie between 50 and 800 g/m^2.

The fibres are thermoplastic and inherently fireproof. The granulates from which the nonwoven fibres are obtained have a specific melt viscosity. The nonwovens are also hydrolysis-resistant. Moreover, they absorb and insulate acoustically. Furthermore, they have a heat-insulating action.

The thicknesses of the nonwoven plies 3 and 5 amount, in the non-compressed state, to about 1/3 to 1/10 of the thickness of the nonwoven ply 4, preferably to about 1/5 of the thickness of the nonwoven ply 4. The thickness of the nonwoven ply 4 lies in absolute terms in the range of 1 to 8 cm, preferably around 5 cm.

The film plies 2 and 2' are fibre-reinforced films of very low thickness. The thickness lies between 10 and 50 µm, preferably around 20 µm. The density lies around 0.9 to 1.4 g/cm^3. The films are likewise thermoplastic and hydrolysis-resistant. In particular, they also have water vapour permeabilities coordinated with one another.

These may materially be inherently fireproof polymers. For example, glass fibres, but also melamine resin fibres, may be laminated on as fibres. The fibres are indicated by the grid in the drawing. However, they are preferably provided on only one side of the film. The grid is between about 1 and 5 mm. Fibres in each case running transversely with respect to one another are provided.

Overall, therefore, the insulation element 1 is a composite structure of three-dimensional and two-dimensional sheet-like textile structures and also films and/or foam materials.

The nonwoven plies 3, 4, 5 may also be replaced by one or more plies of a foam material, such as, in particular, polyimide foam board stock.

Fig. 2 illustrates a corresponding exemplary embodiment.

Essentially only the differences from the insulation part 1 according to Fig. 1 are explained below. Reference is otherwise made to the above description of the insulation part 1.

In the exemplary embodiment of Fig. 2, a middle polyimide foam board stock 6 is provided which is covered on both sides by nonwoven plies 3' and 5'. The nonwoven plies 3' and 5' are provided so as to run through as far as the marginal edge 7, while the foam board stock 6 ends short of the marginal edge 7. A gusset 8 is therefore obtained. In practice, however, this gusset 8 may also be filled with foam board stock, for example by means of appropriate edge compression. Furthermore, the foam board stock may also be provided so as to run into the marginal edge 7, by means of corresponding compression, for example during welding. The foam board stock 6 is polyimide foam material in the exemplary embodiment.

All the features disclosed are essential to the invention. The disclosure of the application hereby also incorporates in full the disclosure content of the associated/accompanying priority documents (copy of the preliminary application), also with the purpose of incorporating features of these documents into claims of the present application.

Patent Claims

1. Nonwoven-based insulation element (1), **characterized by** a layered build-up consisting of different nonwovens, such as textured nonwoven or melt-spun nonwoven.

2. Insulation element according to Claim 1 or particularly according to this, characterized in that a textured nonwoven layer (4) is covered on both sides by a melt-spun nonwoven layer (3, 5).

3. Insulation element according to one or more of the preceding claims or particularly according to these, characterized in that the textured nonwoven layer (4) is thicker than the melt-spun nonwoven layer (3, 5).

4. Insulation element according to one or more of the preceding claims or particularly according to these, characterized in that the textured nonwoven layer (4) has a multiple of the thickness of the melt-spun nonwoven layer (3, 5).

5. Insulation element according to one or more of the preceding claims or particularly according to these, characterized in that the nonwoven plies (3, 4, 5) are covered, further, by a film ply (2, 2').

6. Insulation element according to one or more of the preceding claims or particularly according to these, characterized in that the film plies (2, 2') are outer plies.

7. Insulation element according to one or more of the preceding claims or particularly according to these, characterized in that the film plies (2, 2') are intermediate plies.

8. Insulation element according to one or more of the preceding claims or particularly according to these, characterized in that the outer film plies (2, 2') are edge-welded, and in that the overall composite structure is thereby held together.

9. Insulation element according to one or more of the preceding claims or particularly according to these, characterized in that the film plies (2, 2') are membrane films permeable to water vapour.

10. Insulation element according to one or more of the preceding claims or particularly according to these, characterized in that a foam material ply is provided.

11. Insulation element according to one or more of the preceding claims or particularly according to these, characterized in that the foam material ply is covered on both sides by a melt-spun nonwoven layer.

12. Insulation element according to one or more of the preceding claims or particularly according to these, characterized in that the foam material ply consists of polyimide board stock.

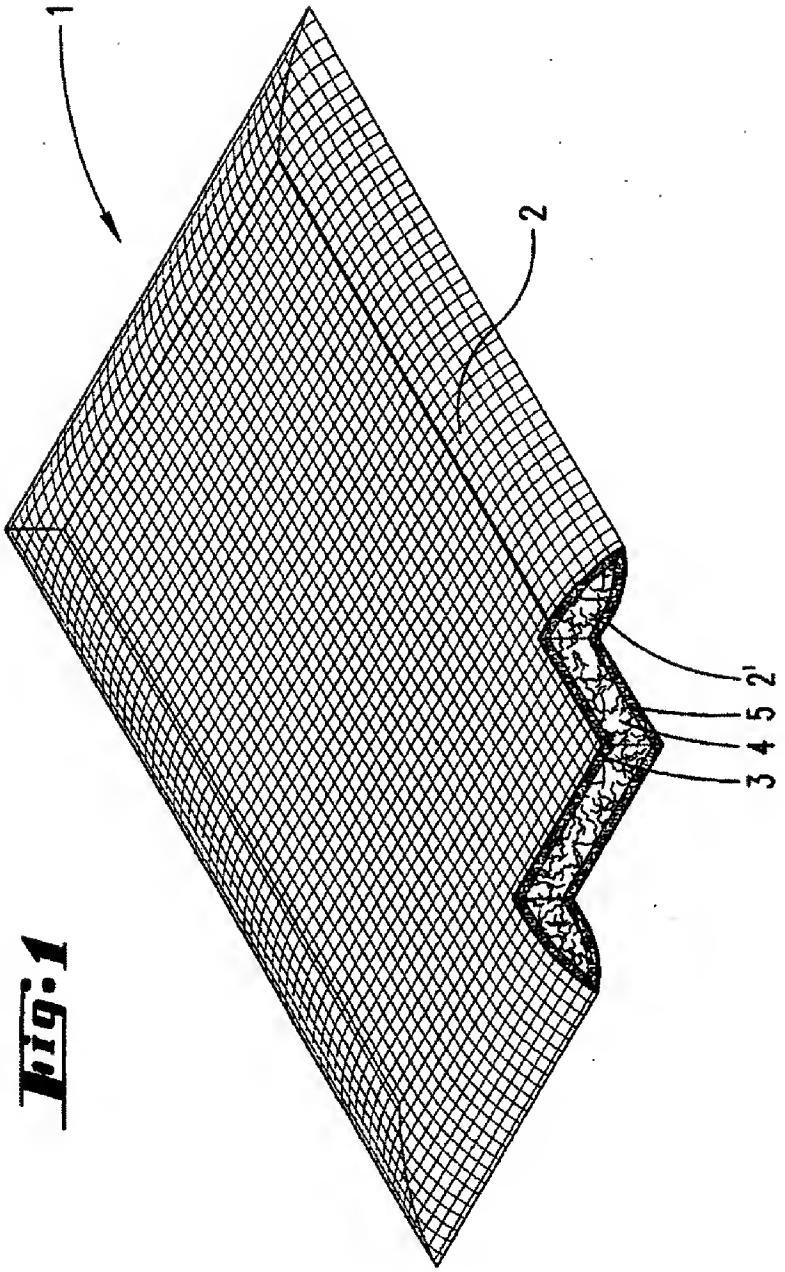

Fig. 1

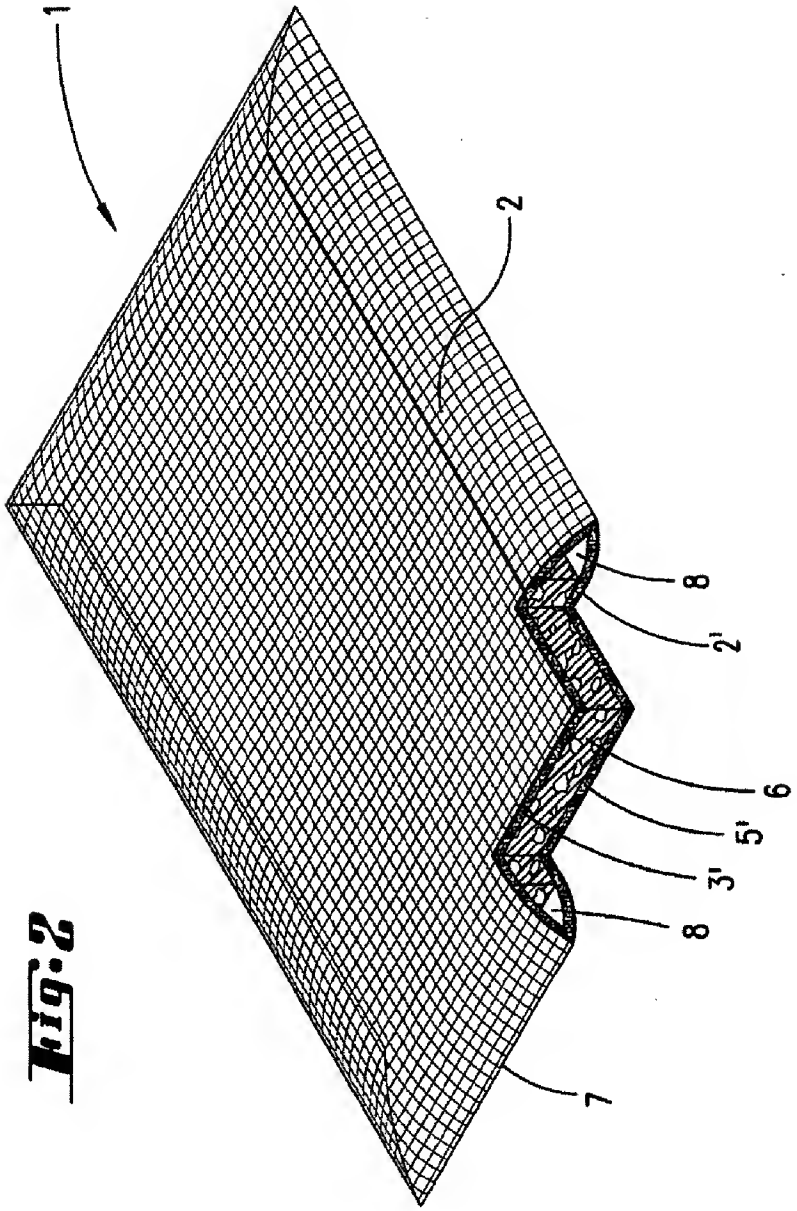

Fig. 2